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The relationship between learning styles and selected characteristics of Malaysian students at Iowa State University

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CHAPTER I. INTRODUCTION

Background of the Study

Malaysia, a rapidly industrializing nation in South East Asia, has abundant natural resources. Currently, the money derived from these resources is being used to educate Malaysians at all levels. An increasing demand for higher education has forced the government to establish more universities and colleges as well as to increase the enrollment of existing higher education facilities.

Despite the rapid expansion in their number and size, the Malaysian universities and colleges still lack the requisite infrastructural capacity, local teaching expertise and manpower to meet the rapidly increasing enrollment in higher education, particularly the high demand for science and technology-based professional courses. This inability of the Malaysian higher education programs to admit qualified candidates who seek admission has forced a large number of Malaysian students to seek higher education overseas, either through government sponsorship or private financing. Through a massive program of scholarships, fellowships, and loans, the government and other agencies have sent a large number of students to the United States of America to study at various levels (Selvaratnam, 1988).

These students being educated abroad in the U.S. differ from one another in numerous ways, including personality, ability, motivation, and skill. They also differ in how they learn best or most efficiently. This difference is often referred to as learning style.

Kolb (1984) reported that an individual's learning style at any given moment is influenced by hereditary as well as factors in the past and present. Factors in the past include

previous experiences and habits of thought and action, personality orientation and education. Among present factors are career choice, current job or current studies.

Students learn in a variety of manners, but their preferred learning styles may vary according to the learning task (Talbot, 1983). Learning styles may also change over the course of the student's college career (Geiger & Pinto, 1991). Kolb, Rubin, and McIntyre (1984) have uncovered interesting relationships between learning styles and college major, career path, and occupational preference. The research of Torbit (1981) supports the relationship between academic discipline, chosen career, and learning styles.

According to the literature, the selection of an academic major, the chosen method of problem solving, and preferred teaching methods reflect learning styles. Kolb (1976) noted that different learning environments require distinctive skills of the learners. Hodges and Evans (1983) argued that learning is more efficient when students are presented with information matched to their learning styles. Kolb and Goldman (1973) found that those students whose learning styles did not fit their discipline would have lower grades.

Some cross-culture research has revealed that certain ethnic groups have learning styles that are distinct from those of other ethnic groups (Dunn et al., 1990). Witkin and Berry (1975) found that the cultural background of individuals can influence learning styles. While not all persons of a particular culture may learn in the same way, there are patterns in how members of different cultures learn more effectively (Flannery, 1991).

Any variability in learning styles might be explained by other characteristics of the individual such as gender or academic major (Miller & Escolme, 1990). Dorsey and Pierson

(1984) found that age and prior experience affect learning style more than did gender or ethnic background.

Claxton and Murrel (1987) reported that students' perceived knowledge of learning styles increased their academic success in college courses. Nelson et al. (1993) found that knowledge of learning styles preferences increases college students' achievement and reduces their drop out rate. Corlett (1992) found that, when students are taught in a manner consistent with their learning styles, they experience increased academic achievement, improve their attitudes toward learning and have a reduction in discipline problems.

Kirk (1986) reported that learning styles correlate with grade point average and parental education. However, age, gender, and college major/minor do not correlate significantly. According to Blank and James (1993), the rationale for assessing student learning styles is to be able to provide a learning environment that maximizes learning for each student by teaching to his or her strengths and avoiding weakness. Understanding how Malaysian students learn is an important variable of effective teaching.

Statement of the Problem

Malaysian students studying in the United States may be stressed by changes in language, climate, culture, diet and attitudes. They may also encounter conflicts in their academic pursuits as a result of their learning styles. Any variability in learning styles might be explained by other characteristics of the individuals such as gender, age, educational level attained, academic major, primary sponsorship, years of work experience, length of stay, or examination format preference.

Despite increased attention and importance placed on student learning styles, there is a lack of research on the learning styles of Malaysian students. However, research on the learning styles of Malaysian students is critical in assisting them to achieve their fullest potential and recognizing diversity when enhancing the educational environment. This study focused on the learning styles of Malaysian students and how these distinctive styles relate to various selected demographic characteristics of the students.

Purpose of the Study

The central purpose of this study was to identify and describe the learning styles of Malaysian students at Iowa State University, and to investigate the relationships between learning styles and selected demographic characteristics.

Research Questions

More specifically, this study attempted to answer the following research questions:

1. What is the preferred learning style of Malaysian students at ISU, by gender, as measured by Kolb's Learning Style Inventory?
2. What is the preferred learning style of Malaysian students at ISU, by age, as measured by Kolb's Learning Style Inventory?
3. What is the preferred learning style of Malaysian students at ISU, by educational level attained, as measured by Kolb's Learning Style Inventory?
4. What is the preferred learning style of Malaysian students at ISU, by academic major, as measured by Kolb's Learning Style Inventory?

5. What is the preferred learning style of Malaysian students at ISU, by primary sponsorship, as measured by Kolb's Learning Style Inventory?
6. What is the preferred learning style of Malaysian students at ISU, by work experience, as measured by Kolb's Learning Style Inventory?
7. What is the preferred learning style of Malaysian students at ISU, by length of stay, as measured by Kolb's Learning Style Inventory?
8. What is the preferred learning style of Malaysian students at ISU, by examination format preferences, as measured by Kolb's Learning Style Inventory?

Hypotheses of the Study

The following null hypotheses were tested:

1. The learning styles of Malaysian students at ISU are not related to gender as measured by Kolb's Learning Style Inventory.
2. The learning styles of Malaysian students at ISU are not related to age as measured by Kolb's Learning Style Inventory.
3. The learning styles of Malaysian students at ISU are not related to educational level attained as measured by Kolb's Learning Style Inventory.
4. The learning styles of Malaysian students at ISU are not related to academic major as measured by Kolb's learning style inventory.
5. The learning styles of Malaysian students at ISU are not related to primary sponsorship as measured by Kolb's Learning Style Inventory.
6. The learning styles of Malaysian students at ISU are not related to years of work

experience as measured by Kolb's Learning Style Inventory.

7. The learning styles of Malaysian students at ISU are not related to length of stay as measured by Kolb's Learning Style Inventory.

8. The learning styles of Malaysian students at ISU are not related to examination format preference as measured by Kolb's Learning Style Inventory.

Assumptions of the Study

The basic assumptions of this study were:

1. Kolb's Learning Style Inventory (1985) is a valid instrument for assessing students' preferences for learning abilities and learning styles.
2. Students have responded to the survey instrument as honestly as possible.
3. Students who have responded to the survey instrument are not atypical of students in terms of variety of learning styles.
4. Students who have responded to the survey instrument are representative of people from various geographical areas of Malaysia.
5. Students who have responded to the survey instrument have educational goals and developmental needs as they enter institutions of higher education and purse their educational goals.
6. The students will be returning to Malaysia after their studies at Iowa State University.

Delimitations of the Study

This study was conducted with the following limitations:

1. This study was limited to Malaysian students enrolling at Iowa State University for spring semester, 1995.
2. This study was limited to Bumiputra Malay students who were sponsored by the Malaysian government and other agencies.

Procedures of the Study

The study procedures consisted of the following:

1. Formulation of the problem.
2. Review the related literature pertaining to learning styles.
3. Identify the population or sample for the study.
4. Prepare a research proposal for the study.
5. Develop a survey instrument to be used for gathering data for the study.
6. Gather data via the instrument.
7. Analyze the data in descriptive terms and through inferential statistics using the Statistical Package Statview for MacIntosh at Iowa State University.
8. Interpret the findings.
9. Write the summary, conclusions, implications, and recommendations.

Definition of Terms

For the purpose of this study, the following definitions were used.

1. *Learning mode*: The way an individual uniquely processes information, including concrete experience (feeling), reflective observation (watching), abstract conceptualization (thinking), and active experimentation (doing) (Kolb, 1976).
2. *Concrete Experience*: The ability or openness to being involved with new experiences and new situations openly and without bias (with emphasis on an intuitive rather than analytical learning) (Kolb, 1976).
3. *Reflective Observation:* The ability to understand the meaning of ideas, experiences or situations of careful observation (open-mindedness and thoughtful judgement are important) (Kolb, 1976).
4. *Abstract Conceptualization:* The ability to integrate concepts into theories (this emphasizes analyzing and thinking) (Kolb, 1976).
5. *Active Experimentation:* The ability to apply theories or ideas to practical situations or problem solving (Kolb, 1976).
6. *Learning Styles:* Various combinations of learning modes which make up an individual's characteristic means of perceiving and processing information. These are diverger, assimilator, converger, and accommodator (Kolb, 1976).
7. *Diverger:* Has dominance in the areas of concrete experience and reflective observation. These individuals are strong in imaginative ability and in viewing concrete situations from many perspectives. Other strengths include investigating new patterns, recognizing problems, and generating alternatives (Kolb, 1976).
8. *Assimilator:* Has dominance in the areas of abstract conceptualization and reflective

observation. These individuals' greatest strengths lie in creating theoretical models. The concern for abstract concept formation is stronger than the concern for the way theories applied (Kolb, 1976).

9. *Converger:* Has dominance in abstract conceptualization and active experimentation. These individuals do best in situations where there is a single correct answer to a question or problem (Kolb, 1976).

10. *Accommodator:* Has dominance in concrete experience and active experimentation. These individuals excel in situations that demand adaption to specific circumstances (Kolb, 1976).

11. *Kolb's Learning Style Inventory (1985):* Originally developed by Kolb in 1976, but later revised to its present twelve-item form as a self-description questionnaire as a means to measure individual learning styles based on experiential learning theory. Four learning modes are assessed: concrete experience, reflective observation, abstract conceptualization, and active experimentation (Kolb, 1985).

12. *Malaysia:* A Federation consisting of (a) Peninsular Malaysia, and (b) Sabah and Sarawak. The population is approximately 7.7 million, of which the major ethnic groups are: 61.9% Bumiputra, 29.5% Chinese, and 8.6% Indians. Bumiputra means "son of soil", a term officially used to cover not only Malays but also all indigenous groups, mainly the Kadazans and Ibans of Sabah and Sarawak (Far Eastern Economic Review, Asia Yearbook, 1994).

13. *Selected demographic characteristics of Malaysian students:* Age, gender, educational level attained, academic major, primary sponsorship, years of work experience, length of stay, and examination format preference.

CHAPTER II. REVIEW OF LITERATURE

Introduction

The central purpose of this study was to identify and describe the learning styles of Malaysian students at Iowa State University, and to investigate the relationships between learning styles and selected demographic characteristics. Kolb's Learning Style Inventory was used in which styles of learners are classified into four types: diverger, assimilator, converger, and accommodator. The selected demographic characteristics of Malaysian students included in the study were: gender, age, educational level attained, academic major, primary sponsorship, years of work experience, length of stay, and examination format preference.

The references sought in conducting this study were: the Educational Resources Information Center (ERIC) Clearinghouse, theses and doctoral dissertations, journals, and publications which provided information relevant to the study. Searches utilized the subject titles of learning styles, and Malaysian students. Information on learning styles were examined in order to gain insight into the development of a data collection device as well as the procedures other researchers used for the collection and analysis of data. On the other hand, information on Asian students and in particular Malaysian students were studied to gather data about their problems and needs in the United States. Much has been written regarding learning styles while little research appeared to have been conducted which related directly to the subject of this study. The literature review is organized into three parts: Learning styles, Kolb's Learning Styles, and Malaysian Students.

Learning Styles

Since the mid 1970s, the concept of learning style has been gaining wide acceptance in a number of educational environments. According to Keefe (1982), learning style has cognitive, affective, and physiological elements. Cognitive elements are internal to the information processing system and require careful training for any adaptive change. Affective elements are preferential in nature and respond to both training and matching strategies. Physiological elements are rooted in learner reactions to the environment and are responsive to instructional matching. These elements appeared in the literature as early as 1892 (Keefe, 1979).

Learning style definitions

The definitions of learning style are abundant. However, there is no widely accepted definition of learning styles, and the concept takes on a somewhat different meaning depending on the definition used. The following definitions have been picked out to be illustrative:

1. According to Gregorc (1979), "Learning style consists of distinctive behaviors which serve as indicators of how a person learns from and adapts to his environment" (p. 1).
2. Schmeck (1988) defined learning style as the peculiar combination of strategies and processes a student habitually employs when trying to learn new material.
3. Learning style describes a student in terms of those educational conditions under which he is most likely to learn. Learning style describes how a student learns, not what he or she has learned (Hunt, 1979).

4. Learning style refers to the affective component of the educational experience that motivates students to choose, attend to, and perform well in a course or other educational endeavor (Canfield, 1988).
5. Learning style is the way in which each the learner begins to concentrate on, process, absorb, and retain information (Dunn, 1988).
6. Kolb (1984) defined learning styles as one's preferred methods of perceiving and processing information.

In summary, these selected researchers have referred to learning style as: addressing perception and ordering (Gregorc, 1979); having contrasts of deep and shallow information processing (Schmeck, 1988); having a conceptual level ranging from low to high (Hunt, 1979); discussing conditions, content, modes, and expectations (Canfield, 1988); learning styles model is multidimensional, encompassing five stimulus categories including: environment, emotional, sociological, physical, and psychological (Dunn, 1988); and an experiential learning model specifying hereditary, past and present experiences, and the environment (Kolb, 1984).

Advantages of learning styles

Butler (1988) postulated four major advantages of the assessment of learning style:

1. It facilitates instructors' examining how they themselves learn;
2. It forces instructors to examining whether they have developed or masked their own learning styles;
3. It forces instructors to examine whether they are harming or frustrating their students by

how they teach; and

4. The knowledge provides a basis for planning strategies to help students who have different learning styles including styles different from their instructors' style.

Research on learning styles

Learning styles have been the focus of considerable study, attracting the interest of researchers in a number of schools, colleges, and universities. Murphy (1992) observed that men perform better in relation to women on objective (multiple choice) tests compared to other forms of assessment. Brown and Burke (1987) argued that the individual's experiences and environmental pressures such as teaching styles, course content and problem presentations may also lead to changes in learning style preferences.

Reid (1987) found that factors such as sex, length of time in the United States, length of time studying English in the United States, field of study, level of education, TOEFL score, and age were related to differences in learning styles. Dorsey and Pierson (1984) concluded that age and prior work experience influence learning styles, and their data indicated that the adult, especially after age 33, learns better by doing.

Domino (1971) found that college students taught in their preferred learning styles scored higher on tests, knowledge of facts, attitude, and efficiency than those taught in instructional styles different from their preferred styles. Fritzsche (1977) suggested that the study of learning styles may yield results that will allow identification of learning styles that are successful in specific learning environments and other styles that are more successful in other environments.

study of learning styles may yield results that will allow identification of learning styles that are successful in specific learning environments and other styles that are more successful in other environments.

Felder and Silverman (1988) suggested that many students underperform in college because their learning style does not match the learning style of their instructor. However, any instructor, teaching in a manner that comes naturally, will be most effective with students whose preferred learning styles match their own.

Research on learning style has suggested that no single instructional method or approach is effective for all students (Dunn & Dunn, 1978). When students cannot learn the way instructors teach, the instructors must then teach students the way they learn (Dunn, 1990). However, McCarthy (1980) has shown that students can be taught specific learning strategies and study skills for particular learning tasks, even though their preferred learning styles do not match the instructor's teaching styles.

Cano et al. (1992) stated that since not all students learn the same, it is essential that instructors recognize the learning style difference of their students and teach in a manner in which all learning styles are considered. Claxton and Murrell (1987) reported that administrators used learning style data to successfully change teaching strategies of faculty in departments that had high dropout rates.

However, Gregorc (1979) stated many reasons for deliberately not matching styles:

1. Students have qualities of all styles to one degree or another;
2. Students need to learn to adapt;

3. Teaching style includes a teacher's personal behaviors and media technologies chosen to deliver and receive information;
4. Too much matching can create boredom; and
5. Periods of mismatch can produce new and varied experiences, but chronic periods of acute mismatch can result in mental, emotional, and physical problems.

Learning style inventories

A person's learning style can be determined by administering learning style inventories. While many inventories are paper and pencil instruments, some are self reported, some are self (or instructor) scored, others require professional scoring and interpretations, and still others may be inappropriate for a particular group (Cox & Zamudio, 1993).

Davis (1989) described three basic types, which help identify learning preference:

1. Cognitive Inventories. How a person perceives and classifies information; how information is ordered and sequenced; what strategies are used to solve problems; whether concrete or abstract information is handled more efficiently; whether preference is for fluid, spontaneous learning or for carefully planned studies; and whether a person is primarily a visual, auditory, or tactile learner.
2. Affective Inventories. How a person is motivated for a learning task, and how he or she remains motivated; what values, beliefs, and attitudes are related to learning; what physical conditions are preferred in the learning environment; what kinds of relationships are desired with the teacher and with the other students; and how success and failure are handled.

3. Psychomotor Inventories. How skills are developed; what type of content (subject matter) a person likes best; how much movement or action is needed in the learning environment; and what modes (ways) of presentation an individual prefers.

Several inventories designed to assess differences in individual learning styles have been developed. However, a factor analytic study of representative learning styles inventories concluded that, when evaluating form, length, and language used, no single instrument was better than any of the others (Ferrall, 1983).

Kolb's Learning Styles

Among several inventories currently being used to assess learning style is the Learning Style Inventory developed by Kolb (1976). This inventory is a good example of a cognitive inventory. Kolb's Learning Style Inventory is based on experiential learning theory which includes the concepts of learning and individual development. According to Kolb (1984), the inventory is based on results of three major psychological studies: (1) the works of Dewey (1938), who emphasized the role of experience in the learning process; (2) Lewin (1951), who stressed the importance of the learner being active in learning; and (3) Piaget (1971), who described intelligence as the result of the interaction of the person and the environment rather than as something innate.

The theory of experiential learning is that ideas are not fixed but are formed and reformed through experience (Kolb, 1984). Experiential learning is a holistic, integrative perspective on learning that combines experience, perception, cognition, and behavior (Kolb, 1976).

Kolb defined learning styles as one's preferred methods for perceiving and processing information. This definition evolved through Kolb's four stages of the experiential learning cycle, from which four adaptive learning modes were identified (see Figure 1). These four modes are ways students deal with their educational environment: concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE). Each of these four learning modes has unique characteristics. Concrete individuals rely on or acquire new learning by tangible, felt qualities of immediate experience. Reflective

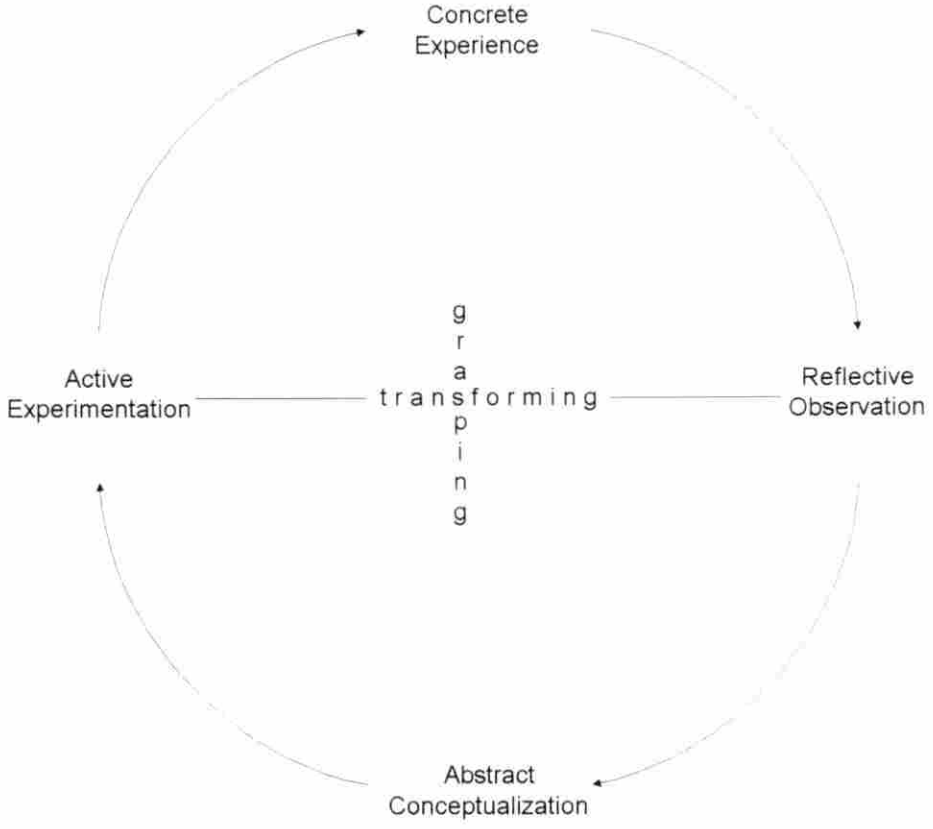

Figure 1. The Kolb learning cycle

individuals exhibit their intentions by an internal reflection on the external world. Abstract individuals comprehend information conceptually and symbolically. Active individuals extend the environment by external manipulation.

Another way to look at the cycle is to distinguish between two fundamental elements in the learning process—grasping and transforming. Kolb (1976) proposed that the learning process is a combination of the four learning abilities, with two of the four being polar opposites. The first combination is a continuum which requires skills for taking in, or grasping information while the second continuum requires skills for transforming the information (see Figure 1).

The continuum for grasping information requires skill in concrete experience (CE) and abstract conceptualization (AC), while the continuum for transforming the experience requires skills in reflective observation (RO) and abstract experimentation (AE). A combination of these four learning abilities shows the student's preferred learning styles. Learners who favor both CE and RO are labeled divergers, while learners who favor both RO and AC are labeled assimilators. Learners favoring both AC and AE are labeled convergers. Finally, learners who favor both AE and CE are labeled accommodators (Kolb, 1976) (see Figure 2).

On the basis of Kolb's research and clinical observations, the characteristics which have been associated with each learning style are summarized as follows:

1. Divergers: Tend to see problems from all sides, person-oriented, imaginative, emotional, and generators of ideas.
2. Assimilators: Tend to be theory-based, problem solvers, abstract creators of models,

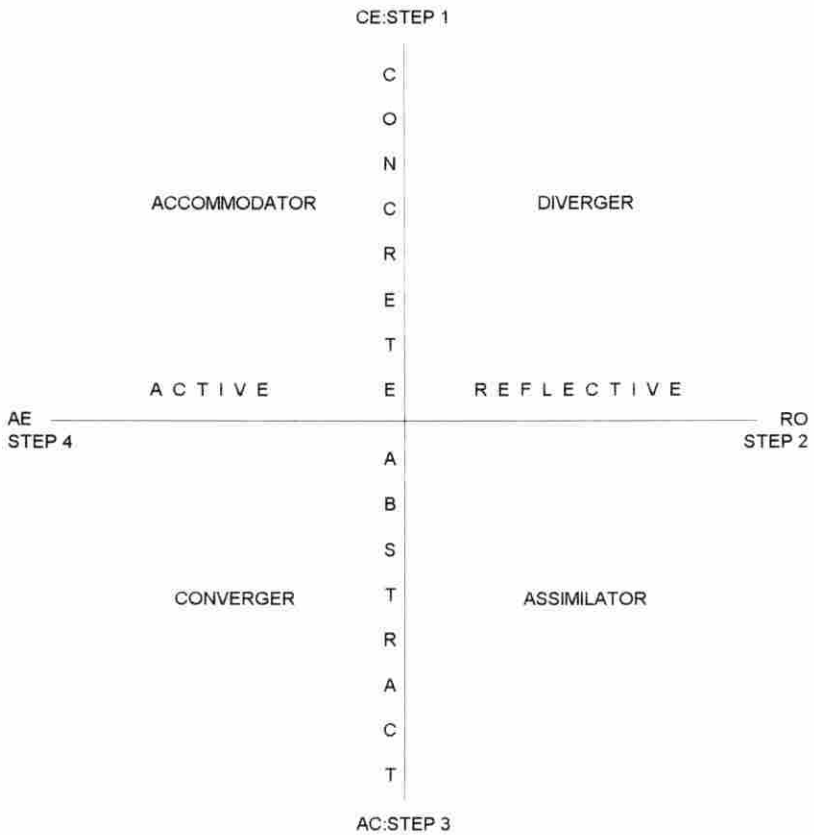

Figure 2. Relationship of Kolb's learning dimensions, modes, and styles

and prefer ideas to people.

3. Convergers: Tend to be simplifiers, task-oriented, practical, unemotional, and prefer things to people.

4. Accommodators: Tend to be doers, risk takers, intuitive, learn by trial and error, and adapt to immediate circumstance.

Differences in learning styles are a result of heredity, past life experiences, and the demands of the present environment. Additionally, through socialization experiences in

family, school, and work, learners tend to emphasize some learning abilities over others (Kolb & Fry, 1975). Kolb (1976) suggested that as people gets older, they move from a predominate style to a more integrated approach in which they use whatever combination of styles is required by the situation.

Wilson (1986) has summarized the theory in terms of four basic propositions:

1. Learning is a cyclic process involving four kinds of styles (i.e., thinking, doing, watching, and feeling);
2. All normal adults possess and use all of the four styles;
3. The level of these styles and preferences for their use vary among individuals; and
4. An individual's learning style preference can be assessed through the use of the Learning Style Inventory.

Katz (1988) stated that Kolb's Learning Style Inventory can be used primarily in three ways:

1. It can serve as a learning device to help individuals or groups to understand their particular learning styles;
2. It can be used to predict such problem-solving behaviors as career selection by relating college majors or professions to a characteristic learning style; and
3. It can be used as a criterion for choosing instructional methods or matching students to various educational options.

Research on Kolb's learning styles

Kolb's Learning Style Inventory has been used in a variety of ways and in several fields to asses how individuals learn and how teachers teach. It has been used extensively to assess learning styles in different academic disciplines. Smith and Kolb (1986) noted that, to date, over 300 published research papers have been cataloged relating to the various aspects of learning style preferences and psychometric properties of Kolb's Learning Style Inventory.

Kolb (1984) found that women tend to prefer concrete learning styles, whereas men are more likely to opt for abstract conceptualization modes of learning. Vernon-Gerstenfeld (1989) found that women are slightly more reflective in their learning style than men. Women tend to be more abstract in their mode of thinking and thus, quicker to adopt computers. In a study by Miller and Kennedy (1979), most engineering alumni displayed a converger learning style, as compared to most social workers in the sample who were accommodators.

Kolb (1981) reported that several students revealed patterns of relationships among academic fields and learning styles. Kolb summarized the clustering of social professions (education, social work, and law) as accommodators, while humanities and social sciences were classified divergers. Professions in the natural sciences were classified as assimilators, while science-based professions (most notably engineering) were clustered as convergers.

Similarly, Kolb (1985) listed careers in organizations, business, and promotion as accommodators; and careers in service organizations, arts, and entertainment as divergers. Kolb also listed information careers and science as assimilators; and careers as specialists and technology as convergers. Kolb (1984) concluded that undergraduate majors are a factor in

forming an individual's learning styles. Undergraduate business majors tended to be accommodators; engineers tended to be convergers; English, history, psychology, and political science majors tended to be divergers; mathematics, chemistry, economics, and sociology majors tended to be assimilators, and physics major fall between converger and assimilator.

Kolb (1984) reported that, if a learning style is matched with the appropriate academic area, students will perform at higher levels. If a mismatch does occur between students' learning styles and their academic areas, the individual either will change to conform to the discipline or leave the field.

Lassan (1984) reported that, as students progress toward the senior year in college, they become less fixed in one learning style, showing a tendency to become better able to learn through a variety of modes. Lassan expected that students would move to greater abstraction as they grew older. As students develop the capacity to learn in a variety of learning modes, they attain the skills to cope with and adapt to the educational environment.

Dorsey and Pierson (1984) studied 513 adults enrolled in occupational education programs and found there is a change to the accommodator learning style in adult students. They also found that age and prior experience affect learning style more than do sex or ethnicity. A study assessing the relationship of freshmen students' learning style, grade point average, and number of credit hours in selected academic fields failed to find any consistent relationship between these measures of outcome and scores on the Learning Style Inventory (Thompson et al., 1978).

Pigg, Busch, and Lacy (1980) surveyed a sample of 349 county extension agents and

found the inventory useful in developing adult educational programs. They also reported that the dominant learning styles type of the county extension agents was that of accommodator. Although this is different from Kolb's result, they proposed that this may be because of the individual's learning styles being modified by the work of the environment.

Korhonen and McCall (1987) administered Kolb's Learning Style Inventory to 120 adults enrolled in common curriculum non credit classes and found that learning style and learning environment interacts to affect achievement. Of the four learning styles, accommodators and divergers scored highest in classes which emphasized remembering by either recognition or recall. Assimilators and convergers scored highest in classes in which understanding the literal message contained in the communication was featured.

Kotar (1980) found a relationship between learning styles and personal characteristics such as sex, parental status, undergraduate major, and preferred instructional type. Kirk (1986) studied learning styles of 70 adult learners and found that learning styles correlate with grade point average and parental education. However, age, gender, and college major or minor do not correlate significantly in his study. In addition, Kirk reported that, of the four learning styles, accommodators were most likely to earn high grade-point averages. Therefore, Kirk was unable to support the relationship of learning styles with choice of academic major, as Kolb had previously established.

Carrier (1987) found that differences in learning styles have been associated with preferences for type, frequency, and intensity of instructional feedback. Computer-based instruction was most effective when the different styles and preferences of the learners were

accommodated.

In a survey of 163 dental hygiene students, Carrier, Newell, and Lange (1982) found that students with different learning styles showed distinctly different preferences for classroom activities. Similarly, Carrier, Williams, and Dalgaard (1988) found that students with different learning styles showed distinctly different preferences for note-taking. Students who were more concrete (accommodators and divergers) did not practice note-taking seriously, however, their counterparts (assimilators and convergers) copied verbatim information from the lecture.

Brenenstuhl and Catalanello (1979) reported that students reached higher levels of academic performance when learning style was used as an aid in individualizing learning environments. In a study of 101 male and female first year university students, Magolda (1989) found that women's cognitive development did not represent a qualitatively different pattern of development from that of men. Men and women did not differ in their views of knowledge (cognitive complexity) and approaches to learning (learning styles).

Dixon (1982) believed that by understanding the difference in learning styles and taking them into account in designing training programs, greater gains can be made in learning, participants' reactions to the program will be more positive, and training time can be reduced.

Sugarman (1985) recommended that trainers recognize their own preferred learning styles and consider how much these preferences are reflected in their course design. Highhouse and Doverspike (1987) investigated the relationship between learning styles and

occupational preference portrayed by the Holland self-directed search. This study revealed a relationship between Artistic interests and the Concrete Experience mode. Enterprising, Social, Conventional, and Realistic interests were all related to the Active Experimentation learning mode.

Malaysian Students

A student in Malaysia goes through six years of primary education and five years of secondary education, before attending college, polytechnic, or university education. Between the ages of 11 and 18, a student has to sit for three major examinations, and depending on his or her performance, will be tracked into different schools or education streams. It is commonly agreed that the students in today's society are under much pressure to excel academically. Therefore, it is not surprising that some students may focus on passing examinations and, in the process, lose sight of the main goal of getting an education. The Malaysian student specializes at the very early age of 15, and much time is spent cramming factual knowledge of a narrow technical nature. This type of education has trained students to analyze facts logically and, when encountering a situation, to act based on an intellectual understanding.

Henderson, Milhouse, and Cao (1993) stated that differences in climate, food, living conditions and standards, social values, ways of behaving, styles of learning, and modes of communication can be very stressful and overwhelming for international students in the United States. According to Biggs (1992), students from Asian countries are often perceived by their professors at Western universities as over-relying on rote learning. They are accused of

internalizing the views of their teachers and textbooks rather than displaying the independent, critical thinking desired at the university level.

Ottenberg, Noi, and Smith (1992) mentioned that Asian learning styles often do not match American teaching styles and techniques. Because of these differences good Asian students sometimes do not do as well as they could. For example, Lam-Phoon (1986) found that Asian students had better tolerance for noise and much preferred learning with a hands-on approach than by listening to lecture or reading; they required more intake, warmth, and routines than did girls and also were more conforming.

Both the curriculum and teaching methods in Malaysian schools have emphasized a largely convergent thinking approach that involves considerable memorization, rote learning, and strict conformity to the expectations of teachers. This could be due to the influence of the traditional culture. Malaysian students are more accustomed to a formal classroom atmosphere. Lectures are the primary teaching method they have experienced. Teachers are looked upon as symbols of authority, learning takes place in a passive manner and personal relationships with students are rare. The ideal instructor is perceived as having knowledge of the subject matter and a willingness to help students.

In Malaysian schools, comprehensive examinations have been used as a basis for academic promotion from one grade to the next. Essay and short answer items are most frequently used for the examination. In contrast, Miller and Escolme (1991) stated that objective tests are commonplace in the United States. International students, particularly those schooled in the British tradition, may find such examination methods new and alien, and

in this case, problems might arise. Reid (1987) found that Malaysian students preferred group learning. It is probable that culture, in particular previous educational experience, enter into student learning style preferences for group and individual learning.

Alsagoff (1986) reported that Malaysian male students were very keen to succeed and make use of the opportunity to earn a degree. They have varied learning preferences. Watkin and Ismail (1994) reported that the more senior Malaysian students were extrinsically motivated and feared failure more often than the juniors. This is probably due to the senior students' recognition that their major public examinations will influence their career prospects. Furthermore, when studying in their own country and using their own first language, Malaysian students tend to use learning strategies designed to maximize understanding, including reading widely, debating issues, and reflecting on what they were learning.

Taylor (1988) found that factors for predicting the first year success of Malaysian students in the U.S. were post-secondary performance, secondary school performance, source of financial support, additional mathematics score, and gender. English proficiency was not significant as a predictor of college success. However, Xia (1991) reported that the most troublesome adjustment problems encountered by Malaysian students in the U.S. were the English language, placement service, financial aid, social and personal aspects, academic aspects, and religious service areas.

The most severe academic problems considered by international students were giving oral reports, participating in classroom discussions, taking notes in class, understanding lectures, and preparing written reports (Sharma, 1971). Graham (1993) found that most

Asian students new to the United States have considerable difficulty with diverse grading systems and technical problems associated with computer systems. The necessity to succeed and not return home as a failure is a stressor for them.

In conclusion, the previous research has indicated that as international students in the United States, Malaysians can expect to have some difficulties with language, educational experience, finances, accommodation, and social interaction. These difficulties do have significant effects on their academic performance.

Summary

Learning style refers to the characteristic ways each individual collects, organizes, and transforms information into useful knowledge and action. It influences such things as the setting in which people learn, the kinds of things they want to learn, and how they will approach learning situations. Students exhibit a variety of learning styles. The learning style of a student is the product of both nature and the environment.

A person's learning style can be determined by administering learning style inventories. Use of learning styles information enables students to be aware of their styles more quickly. This can aid teachers in understanding and enhancing students' attitudes toward and performance in the classroom, and understanding the importance of person-environment fit.

Learning styles tend to be stable traits and may affect a wide range of learning behaviors. Learning styles come as a result of our heredity, experiences, and environment. They are a result of nature and nurture and can be modified with age and experience. Styles are value-free and no style is better than another. In fact, some styles may be more effective

than others in certain situations.

The Kolb Learning Style Inventory (1985) measures an individual's relative emphasis on concrete experience, abstract conceptualization, active experimentation, and reflective observation. In addition, the inventory indicates the extent to which an individual's preferred style is abstract versus concrete and active experimentation versus reflective observation.

Kolb has designated four learning types as diverger, assimilator, converger, and accommodator. While each type has certain strengths and weakness, people learn more effectively as they develop learning skills in their areas of weakness.

The Kolb Learning Style Inventory helps students see which of these learning types is their preferred style. However, the responsibility for the professional application of these known learning styles rests with the instructor. Therefore, learning style is important in an academic context. Research suggests individuals learn best when taught using methods that complement their preferred learning styles. The measurement of learning styles has important implications for classroom instruction, training and development, and organizational interventions.

A number of research studies have been completed on student preferred learning styles. These studies were reported from two perspectives: the relationship of student learning preferences to instructional setting and the relationship of learning styles to students academic performance. Regardless of the focus of assessment, conclusions and recommendations throughout the learning style literature reflect several common themes:

1. Individuals prefer to learn differently;

2. Individual learning styles are identifiable;
3. Students' recognition of their own learning styles can help them make useful decisions regarding their approaches to selecting and processing information;
4. Matching or mismatching learning style and instructional technique has significant implications for both cognitive and affective learning; and
5. Instructors and institutions have a responsibility to consider style in instructional delivery. Within the university environment, the effect of teaching styles, course content and problem presentation are all likely to induce complementary changes in learning styles.

No research has been reported on the learning style preferences of Malaysian students who study in the United States. An understanding of the learning styles preferences of these students will provide insight into obstacles and support systems which can be used to enrich the instructional environment for degree programs.

CHAPTER III. METHODOLOGY

The central purpose of this study was to identify and describe the learning styles of Malaysian students at Iowa State University, and to determine the relationships between learning styles and selected demographic characteristics. This study employed a descriptive method of research with a purpose to systematically describe a situation or area of interest factually and accurately (Isaac & Michael, 1990). According to Issac and Michael, the design is appropriate for describing the learning style of the study population and for exploring possible relationships between learning style and selected characteristics of study population.

In this chapter a description of the subjects, the survey instrument, data collection, and data analysis are presented.

Population of the Study

Ideally, a study should be conducted with Malaysian students studying in all the United States. However, due to financial constraints the researcher decided to limit this study to the Malaysian student population at Iowa State University in Ames. The enrollment of Malaysian students in this institution is the largest among the universities in Iowa.

Two sources were used to identify the subjects, both published documents. One source document used was the list of names of Malaysian students, released by the Office of International Students and Scholars at Iowa State University. The document lists the names, addresses and telephone numbers as well as academic major. The second document was a Newsletter of Malaysian Students, published by the Mid-west Malaysian Students Department

in Evanston, Illinois. From this information, subjects were identified and selected to form an overall list for the population of study. Several telephone calls were made to verify names, addresses, and academic major as many of the Malaysian students shared houses, flats, or apartments.

This process enabled the researcher to identify 63 sponsored undergraduates Malaysian students at Iowa State University. The population included sponsored students (N = 53) and students whose sponsorship had been terminated recently due to low academic performance (N = 10). According to Krejcie and Morgan (1970), as the population increases, the sample size increases at a diminishing rate and remains relatively constant at slightly more than 380 cases. So, the sample size for a population of 63 should be 55. Since the population size for the study was small, the researcher was advised by statisticians to sample the entire population, who were Malaysian Malays and single (unmarried). All subjects were enrolled in various courses during the spring semester of 1995. A breakdown by gender revealed that 54.0 percent (N = 34) were males and 46.0 percent (N = 29) were females.

Survey Instrument

The survey instrument was developed in two parts to collect data relevant to the objectives, research questions, and hypotheses on the study. Part one was the Learning Style Inventory (LSI) (Kolb, 1985) that measures learning styles of the subject. The scoring of LSI served as the dependent variables of this study. Part two of the survey instrument employed a Student Demographic Questionnaire in order to describe the selected characteristics of the subjects. These selected characteristics served as the independent variables for this study.

For this study, several learning style instruments were reviewed: Gregorc Style Delineator (GSD) developed by Gregorc (1985); Myers-Briggs Type Indicator (MBTI) developed by Briggs and Myers (1983); Learning Style Inventory (LSI) developed by Kolb (1985); and Learning Style Questionnaire (LSQ) developed by Marshall and Merritt (1984). Kolb's Learning Style Inventory (1985) was selected.

The researcher purchased the Kolb's Learning Style Inventory (LSI) (1985), which is available commercially in printed form from the McBer Company in Boston. Kolb's theory and instrument were selected because the theory provides a perspective that extends beyond the classroom and integrates broadly based ideas about development (Claxton & Ralston, 1978). The instrument is brief, straightforward, and constructed so subjects can respond easily as they would in a learning situation. It is also capable of measuring and predicting behavior in a way that is consistent with the theory of experiential learning (Trayer, 1991). There is a valid relationship between learning style and career choice, professional education, and learning and development (Katz, 1988). As the instrument can be completed in a short period of time and be effectively administered through a mail survey as well, it has been extensively tested among small and large adult populations (Kolb, 1981).

Kolb's Learning Style Inventory (1985) is a paper and pencil instrument, and consists of 12 sentence completion items related to learning which can be completed in 10-15 minutes. It is designed to measure the strengths and weaknesses of each subject. Subjects are asked to rank four responses, from 4 (most preferred) to 1 (least preferred), based on how they believe they learn best. The total of each of the four columns will range from 12 to 48 and will

reflect each of the four stages in the learning cycle as described in Kolb's experiential learning theory, namely, Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation (AE). In addition, two other scores are computed from these four: (a) AC minus CE indicates the degree to which the learning style is biased toward abstraction (positive number) or concreteness (negative number), and (b) RO minus AE reflects a possible bias toward reflection (positive number) or activity (negative number). These two scores will range from +36 to -36 and may be used to determine into which quadrant the subject's preferred style of learning falls. The four quadrants are identified as Diverger, Assimilator, Converger, or Accommodator. These four styles indicate whether the subject (a) views concrete situations in many ways (Diverger), (b) consolidates a wide range of information into a logical form (Assimilator), (c) emphasizes the use of ideas or theories in a practical manner (Converger), or (d) learns primarily from hands on experiences (Accommodator).

Several articles have reported the reliability and validity of the LSI. For the revised LSI, Smith and Kolb (1986) reported high internal reliability as measured by Cronbach's alpha coefficients for each of the scales (N = 268), with a range of .73 to .88. Sim et al. (1986) noted improved reliability from the earlier form, reporting coefficients ranging from .76 to .85. The LSI was normed on a sample of 1,446 adults between the ages of 18 and 60, with 638 men and 801 women representing diverse ethnic groups and career fields with an average education of two years of college (Smith & Kolb, 1986).

The Student Demographic Questionnaire was designed for this study by the researcher

and solicited information through a combination of open-ended and multiple response questions. The initial draft of the Student Demographic Questionnaire originally had twelve questions. A group of ten graduate students at Iowa State University examined the questionnaire late in January, 1995. The reviewers were asked to comment on any words or phrases that might be confusing or hard to understand. They were also asked also point out any question that might be irrelevant to Malaysian students and to suggest other questions that might be appropriate in developing this questionnaire. Revisions were made as the result of the suggestions made by the reviewers regarding the draft questionnaire. Questions on ethnicity, TOEFL scores, Grade Point Average, and student classifications were removed and replaced with a question on examination format preference. The final form of the Student Demographic Questionnaire contained items that elicited data on gender, age, educational level attained, length of stay, academic major, primary sponsorship, years of work experience, and examination format preference.

The survey instrument, which consists of Kolb's Learning Style Inventory and preliminary revised Student Demographic Questionnaire, was pilot tested with a group of 20 privately funded undergraduate Malaysian students at Iowa State University early in March, 1995. They were asked to answer the questions as best as they could and identify the time required to complete the questionnaire. The results of the pilot test revealed that the questionnaire was easy to follow. The time needed to complete it was between 25-30 minutes.

The survey instrument developed for use was reviewed during the Industrial Education

and Technology (IEDT) 615 and Research and Evaluation (RESEV) 615 classes, and approved by the major professor associated with this study. It was then submitted for approval by the Human Subjects Review Committee at Iowa State University to ensure that no unintended improprieties would result from the administration of the survey instrument. A copy of the signed approval is shown in Appendix A, and the survey instrument used to collect the data appears in Appendix B.

Data Collection Procedure

The subjects in this study were 63 Malaysian students at Iowa State University, Ames, during the spring semester of 1995. They were all sponsored undergraduates majoring in various courses. The researcher made appointments to visit the subjects to administer the survey instrument personally, between April 9, 1995 and April 16, 1995. Those who volunteered to participate in the study signed an informed consent form that was presented prior to the administration of the survey instrument. A copy of the consent form is shown in Appendix C. Prior to receiving the survey instrument, the subjects were urged to answer honestly, and assured that all responses would be kept anonymous and confidential. Confidentiality was maintained throughout the study by assigning a code to each subject during data collection and analysis. Subjects were encouraged to ask any questions they might have concerning the study.

The researcher used *Webster's New World Dictionary* (3rd ed.) (Neufeldt & Gulralnik, 1987) to clarify the meanings of the phrases that were to be ranked. The subjects were encouraged to focus on their individual learning styles rather than activities prescribed by a

particular classroom instructor or method. The completed survey instruments were collected on the same day after each visit by the researcher. A total of 88.9 percent (N = 56) of the responses were collected along with signatures on the consent form. All were usable for data analysis.

The researcher scored the Learning Style Inventories (LSI) and computed a dominant learning style for each respondent in accordance with LSI Self-Scoring Inventory and Interpretation Booklet (Kolb, 1985). The Student Demographic Questionnaire completed by each respondent also yielded information regarding each respondent's gender, age, educational level attained, academic major, primary sponsorship, years of work experience, length of stay, and examination format preferences.

Data Analysis

Upon completion of the data collection, the information was analyzed to answer the research questions and test the hypotheses. The statistical package StatView 11 for the Macintosh (1989), provided by the Computers Services at Iowa State University, was employed to process the data. Variables of the study included both continuous and categorical measures. Therefore, coding and/or recoding was necessary for some of the variables prior to statistical calculations and hypotheses testing. The independent variables for this study were: gender, age, educational level attained, academic major, primary sponsorship, years of work experience, length of stay, and examination format preferences. The dependent variables were the scores of the LSI (diverger, assimilator, converger, and accommodator).

Gender was recorded as two categories, male and female. Age was measured in years, and educational level attained was categorized into two levels, namely, diploma and certificate. Length of stay was measured in months. Academic major was posed as open-ended questions then coded into two broad and general categories—business and non-business. The business category included academic majors such as accounting, economics, finance, management information system, marketing, and production/operation management, while non-business included those of biochemistry, chemistry, food science, food service management, aerospace engineering, architecture, computer engineering, computer science, and landscape architecture. Primary sponsorship was categorized into two categories, government and semi-government. Years of work experience were measured in years. The preferences of subjects for each examination format (essay, short answer, true-false, multiple choice, and matching) were analyzed by identifying the most frequently chosen formats. The number of times each format was chosen as the most preferred by the subjects was counted on the frequency scale.

Scoring of the LSI was consistent with procedures outlined in *LSI user's guide* (Kolb & Smith, 1986). Four learning mode scores—concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE); and two learning orientation scores—abstract conceptualization scores minus concrete experience scores (AC-CE), and active experimentation scores minus reflective observation scores (AE-RO) were obtained for each subject.

The subjects' preferences for Kolb's (1985) learning style types (diverger, assimilator,

converger, and accommodator) are identified using the learning orientation norm scores. Individuals who score lower than the sample median on both AC-CE and AE-RO dimensions are classified as divergers, while those who score higher than sample median on both AC-CE and AE-RO dimensions are convergers. Individuals who score lower than sample median on AC-CE dimension but score higher than sample median on AE-RO dimension, are accommodators, and those who score higher than sample median on AC-CE dimension and score lower than sample median on AE-RO are classified as assimilators.

Since the samples were not random and all the variables were categorized, descriptive statistics and the chi-square statistical procedure were used. Descriptive statistics including means, standard deviations, frequencies, and percentages were used to examine several research questions. In addition to frequency analyses, the responses to these variables were categorized, making it possible to compare responses by differences across the variables under investigation. The chi-square statistical procedure was used to analyze relationships between variables. First, it must be noted that learning styles are not normally distributed in the population. Second, Kolb's LSI scores place students in categories identified as diverger or converger, assimilator or accommodator type. The level of significance chosen for this study was $\alpha = .05$. The .05 alpha level is a good fail-safe standard because it is both convenient and stringent enough to safeguard against accepting an insignificant result as significant. Analysis of the information was completed in May, 1995. A final written report for this study was completed in June, 1995.

Summary

In this chapter the description of subjects, instrument, and procedures was presented. The methods and procedures used to collect and analyze the data for the study were explained. Also, the data analysis processes were covered. The results of these statistical analyses and procedures on the data are provided and discussed in the next chapter.

CHAPTER IV. RESULTS

Introduction

The central purpose of this study was to identify and describe the learning styles of Malaysian students at Iowa State University, and to determine the relationships between learning styles and selected demographic characteristics (gender, age, educational level attained, academic major, primary sponsorship, years of work experience, length of stay, and examination format preference.

Data relevant to these objectives were collected through a two-part survey instrument described in the preceding chapter. This chapter has been devoted to reporting the results gained through analyses of data obtained from that survey instrument. The results are reported under four main sections: (a) Response Rates; (b) Description of Respondents; (c) Learning Style Inventory Results; and (d) Testing the Null Hypotheses.

Response Rates

Data were collected between April 9, 1995 and April 16, 1995, from a nonrandom sample of 63 undergraduate Malaysian students enrolled in full-time degree programs at Iowa State University, during the spring semester of 1995. Survey instruments were distributed to 29 females (46.03%) and 34 males (54.97%). All the respondents were single Malaysian Malays. Fifty-six survey instruments were completed for a response rate of 88.89 percent. All 29 females (100%) and 27 males (79.41%) participated in the study. Only seven of 34 male students (20.59%) were unable to participate during the data collection period due to

one of the following reasons: (a) they were not in town during the collection period; (b) they canceled the appointment and were unable to reschedule; or (c) some of them were simply not available during the data collection period. Participation in this study was voluntary. All completed survey instruments were usable for data analysis. Table 1 shows that of 56 students, 29 females (51.79%) and 27 males (48.21%) participated in this study.

Table 1. Survey response

Gender	Surveys Distributed		Surveys Completed	
	No.	Percent	No	Percent
Female	29	46.03	29	51.79
Male	34	54.97	27	48.21
Total	63	100.00	56	100.00

Description of the Respondents

The independent variables used in this study were obtained by asking respondents to indicate the following selected characteristics: gender, age, educational level attained, academic major, primary sponsorship, years of work experience, length of stay, and examination format preferences. Information related to selected characteristics is depicted in Table 2.

Table 2. Selected characteristics of the respondents (N = 56)

Variable	Frequency	Percentage
Gender		
Male	29	51.79
Female	27	48.21
Age		
19 to 20	4	7.14
21 to 24	40	71.43
25 to 31	12	21.43
Education level attained		
Certificate	29	51.79
Diploma	27	48.21
Academic major		
Accounting	1	1.79
Aerospace Engineering	2	3.57
Architecture	1	1.79
Biochemistry	1	1.79
Chemistry	2	3.57
Computer Engineering	2	3.57
Computer Science	7	12.50
Economics	4	7.14
Finance	11	10.64
Food Science	2	3.57
Food Service Management	1	1.79
Landscape Architecture	1	1.79
Management Information Systems	5	8.93
Marketing	12	21.42
Production/Operation Management	4	7.14
Primary sponsorship		
Federal government	33	58.93
Semi-government	23	41.07
Years of work experience		
None	34	60.70
1 or less	9	16.08
2 to 3	9	16.08
4 or more	4	7.14
Length of stay		
1 or less	21	37.50
2 to 3	30	53.57
4 or more	5	8.93
Examination format preference		
Essay	8	14.26
Matching	10	17.86
Multiple Choice	15	26.79
Short Answer	19	33.93
True-False	4	7.14

Gender

The gender of the participants were nearly equally divided. Of the 56 full-time students completing the survey instrument, 51.79 percent (N = 29) were females and 48.21 percent (N = 27) were males.

Age

Respondents ranged in age from 19 to 31 years, with a mean age of 23.09 years and a standard deviation of 2.22. When looking at the age variable it was found that 7.14 percent (N = 4) of the Malaysian students were under the age 20, with that entire proportion being female. Of the respondents overall, 71.43 percent (N = 40) were in the 20 to 24 age bracket. In the 20 to 24 age bracket, 62.50 percent (N = 25) were female and 37.50 percent (N = 15) were male. There were 21.43 percent of the participants in the 25 to 31 age bracket, with the entire portion being male.

When analyzed by classification, 46.43 percent (N = 26) of the undergraduate students were 22 years of age or younger, with 76.92 percent (N = 20) being female and 23.08 percent (N = 6) male, or a four to one ratio of female to male. There were 53.57 percent (N = 30) in the 23 years of age or older group, with 30.00 percent (N = 9) female compared to 70.00 percent (N = 21) male.

Educational level attained

When assessing the highest level of education achieved, 51.79 percent (N = 29) of the respondents indicated they had a one- to two-year college certificate, while 48.21 percent (N

= 27) had a three-year college diploma. When looking at educational level by gender, 62.07 percent (N = 18) of the females and 37.93 percent (N = 11) of the males reported they had from a one- to two-year college certificate, while 40.74 percent (N = 11) of the females and 56.26 percent (N = 16) of the males reported they had a three-year college diploma.

Academic major

The undergraduate Malaysian students were studying in 15 different areas at ISU. In the order of greatest to least, they were studying: marketing, 21.42 percent (N = 12); finance, 19.64 percent (N = 11); computer science, 12.50 percent (N = 7); management information systems, 8.93 percent (N = 5); economics, and production/operation management, each was 7.14 percent (N = 4); chemistry, food science, aerospace engineering, and computer engineering, each was 3.57 percent (N = 2); and accounting, biochemistry, food service management, architecture, and landscape architecture, each was 1.79 percent (N = 1).

When looking at the different classifications, 66.01 percent (N = 37) of the undergraduates were business majors, and 33.93 percent (N = 19) were nonbusiness majors. By gender, 54.05 percent (N = 20) of the females and 45.95 percent (N=17) of the males were in business majors, while 47.37 percent (N = 9) of the females and 52.63 percent (N = 10) of the males were in nonbusiness majors.

Primary sponsorship

Students were paying for their education basically through scholarships, with 58.93 percent (N = 33) receiving federal government scholarships and 41.07 percent (N = 23)

receiving semi-government scholarships. Of the females, 60.61 percent (N = 20) received federal government scholarships compared to 39.39 percent (N = 13) of the males. Receiving semi-government scholarships were 39.13 percent (N = 9) of the females compared to 60.87 percent (N = 14) of the males.

Years of work experience

Students were asked to indicate the number of years of work experience they had before coming to Iowa State University. The number ranged from no work experience to seven years. The mean was .83 years with a standard deviation of 1.55. Of the student population, 16.07 percent (N = 9) indicated they had one year or less of work experience, with 66.67 percent (N = 6) of the females reporting they had one year or less of work experience compared to 33.33 percent (N = 3) of the males; 16.07 percent (N = 9) had two to three years of work experience, with this entire portion being male; 7.14 percent (N = 4) had four or more years of work experience, with this entire portion also male. The reminder of the students, 60.71 percent (N = 34) had no work experience at all, with 67.65 percent (N = 23) being female and 32.35 percent (N = 11) being male.

When assessing years of work experience by different classifications, 39.29 percent (N = 22) had work experience, or a total of 27.27 percent (N = 6) female and 72.73 percent (N = 16) male. The reminder of the students had no work experience at all. This category was comprised of 60.71 percent (N = 34), or 67.65 percent (N = 23) female compared to 32.35 percent (N = 11) male.

Length of stay

The number of years the students had lived in the United States ranged from four months to 76 months. The mean was 18.43 months and the standard deviation was 14.00. Of the students participating in this study, 37.50 percent (N = 21) had been living in the United States for one year or less; or 57.14 percent (N = 12) female and 42.86 percent (N = 9) male. There were 53.57 (N = 30) of the students living in the United States for two to three years, or 53.33 percent (N = 16) female compared to 46.67 percent (N = 14) males. There were only 8.93 percent (N = 5) living in the United States for four years or more, or 20.00 percent (N = 1) female and 80.00 percent (N = 4) male.

When looked at by different classification, 37.50 percent (N = 21) of the undergraduates indicated they had been staying in the United States for one year or less, and 62.50 percent (N = 35) over one year. Of the females, 57.14 percent (N = 12) indicated they had been staying in the United States for one year or less, and 48.57 percent (N = 17) over one year. For the males, 42.86 percent (N = 9) reported one year or less, and 51.43 percent (N = 18) had been staying in the United States for over one year.

Examination format preference

Students were asked what they would prefer in examination formats. Short answers were the first choice for 33.93 percent (N = 19), with 26.79 percent (N = 15) desiring multiple choices, 17.86 percent (N = 10) matching, 14.29 percent (N = 8) essay, and 7.14 percent (N = 4) indicating true-false. A preference for short answer was stated by 63.16 percent (N = 12) of the females and 36.84 percent (N = 7) of the males; 53.33 percent (N = 8) of the females

and 46.67 percent (N = 7) of the males preferred multiple choice; 60 percent (N = 6) of the females and 40 percent (N = 4) of the males said they would prefer matching formats; 37.50 percent (N = 3) of the females indicated they would prefer essay formats compared to 62.50 percent (N = 5) of the males; and the entire proportion of male students reported they would prefer for true-false formats.

When looked at by different classification, 51.79 percent (N = 29) of the students reported they would prefer for selection types, and 48.21 percent (N = 27) said they would prefer supply types. For the males, 55.56 percent (N = 15) preferred selection types, and 44.44 percent (N = 12) preferred for supply types. Whereas 48.28 percent (N = 14) of the females preferred selection types, 51.72 percent (N = 15) preferred supply types.

Summary of description of respondents

Of the 56 respondents, the major selected characteristics revealed that 51.79 percent (N = 29) were females, 71.43 percent (N = 40) of respondents were within the 20 - 24 age group. Of the respondents, 51.79 percent (N = 29) had one- to two-year college certificates, and 66.07 percent (N = 37) of the respondents were business majors. Of the respondents, 58.93 percent (N = 33) received federal government scholarships, and 60.71 percent (N = 34) of the respondents had no work experience. Of the respondents, 62.50 percent (N = 35) had been staying in the United States for over one year, and 33.93 percent (N = 19) would prefer short answer examination formats.

Learning Style Inventory Results

Kolb's (1985) Learning style Inventory (LSI) was used to assess undergraduate Malaysian students learning styles, and scores on the LSI were calculated in accordance with Kolb's guidelines. Four learning modes scores (AC, AE, CO, RO), and two learning orientations scores (AC-CE, AE-RO) were obtained for each respondent. Higher scores indicate greater emphasis on a particular learning mode and higher positive numbers on a learning orientation score indicate more abstract or more active emphasis, while higher negative numbers indicate more concrete or more reflective emphasis. The LSI scores for this study are presented in Table 3.

Learning modes

The AC score ranged from 16 to 47; CE ranged from 14 to 45; AE score ranged from 13 to 48; and RO ranged from 15 to 41. Concrete experience mode was least preferred, while

Table 3. Respondents' learning style inventory scores (N = 56)

Learning Style Inventory	Mean	Standard Deviation
Learning Modes/Abilities		
Abstract Conceptualization (AC)	32.64	6.67
Active Experimentation (AE)	30.07	7.19
Concrete Experience (CE)	26.66	8.50
Reflective Observation (RO)	30.63	6.74
Learning Orientations/Dimensions		
Grasping (AC - CE)	5.98	12.43
Transforming (AE - RO)	-0.55	10.73

preference for the other three learning modes abstract conceptualization, active experimentation, and reflective observation were similar.

Learning orientations

Scores on the abstract-concrete (AC-CE), or taking-in information dimension, ranged from -19 to 32; and active-reflective (AE-RO), or transformation dimension, scores ranged from -28 to 25. The abstract conceptualization mode was preferred over the concrete experience mode for taking-in or grasping information. There was no dominant mode between reflective observation and active experimentation for transforming the information.

Learning styles

Table 4 illustrates the frequencies and distribution of learning styles in the total sample of 56 respondents. All Kolb learning styles are represented in the sample. The assimilator style was preferred by 28.57 percent (N = 16); accommodator by 26.79 percent (N = 15), diverger by 26.79 percent (N = 15), and converger by 17.85 percent (N = 10).

Table 4. Respondents' preferences for learning styles

Learning Style	Frequency	Percentage
Accommodator	15	26.79
Assimilator	16	28.57
Converger	10	17.85
Diverger	15	26.79
Total	56	100.00

Summary of learning styles

Malaysian students at Iowa State University were evenly distributed across the four styles as measured by Kolb's Learning Style Inventory (1985), with only 10 percent variability between assimilators (28.57%) and convergers (17.85%), and accommodators (26.79%) and divergers (26.79%).

Testing the Null Hypotheses

Eight null hypotheses were tested using chi-square statistic to analyze the relationship between learning styles (dependent variables) and selected demographic characteristics (independent variables) of Malaysian students at Iowa State University (ISU).

Hypothesis 1: The learning styles of Malaysian students at ISU are not related to gender as measured by Kolb's Learning Style Inventory.

The purpose of this hypothesis was to detect whether there is a relationship between gender and learning style. As shown in Table 5, the results of the chi-square statistic were not significant; therefore, the null hypotheses was not rejected. It can be concluded that the gender of Malaysian students at Iowa State University is not related to their learning styles as measured by Kolb's learning style inventory.

Hypotheses 2: The learning styles of Malaysian students at ISU are not related to age as measured by Kolb's Learning Style Inventory.

The purpose of this hypothesis was to detect whether there is a relationship between age and learning style. As shown in Table 6, the results of the chi-square statistic were not significant; therefore, the null hypotheses was not rejected. It can be concluded that the age of Malaysian students at Iowa State University is not related to their learning styles as

Table 5. Distribution of students by gender and learning style

Learning Style	Female		Male		Total	
	N	%	N	%	N	%
Accommodator	10	66.67	5	33.33	15	26.79
Assimilator	6	37.50	10	62.50	16	28.57
Converger	4	40.00	6	60.00	10	17.85
Diverger	9	60.00	6	40.00	15	26.79
TOTAL	29	51.79	27	48.21	56	100.00

$\chi^2 = 3.5998$; df = 3; p = 0.308

Table 6. Distribution of students by age and learning style

Learning Style	Below 23		Above 23		Total	
	N	%	N	%	N	%
Accommodator	10	66.67	5	33.33	15	26.79
Assimilator	6	37.50	10	62.50	16	28.57
Converger	3	30.00	7	70.00	10	17.85
Diverger	7	46.67	8	53.57	15	26.79
TOTAL	26	46.43	30	53.57	56	100.00

$\chi^2 = 4.0684$; df = 3; p = 0.2542

measured by Kolb's learning style inventory.

Hypothesis 3: The learning styles of Malaysian students at ISU are not related to educational level attained as measured by Kolb's Learning Style Inventory.

The purpose of this hypothesis was to detect whether there is a relationship between educational level attained and learning style. As shown in Table 7, the results of the chi-square statistic were not significant; therefore, the null hypotheses was not rejected. It can be

Table 7. Distribution of students by educational level attained and learning style

Learning Style	Diploma		Certificate		Total	
	N	%	N	%	N	%
Accommodator	7	46.67	8	53.33	15	26.79
Assimilator	7	43.75	9	56.25	16	28.57
Converger	5	50.00	5	50.00	10	17.85
Diverger	8	53.33	7	46.67	15	26.79
TOTAL	27	48.21	29	51.79	56	100.00

$\chi^2 = 0.3123$; df = 3; p = 0.9577

concluded that the educational level attained of Malaysian students at Iowa State University is not related to their learning styles as measured by Kolb's learning style inventory.

Hypothesis 4: The learning styles of Malaysian students at ISU are not related to academic major as measured by Kolb's Learning Style Inventory.

The purpose of this hypothesis was to detect whether there is a relationship between academic major and learning style. As shown in Table 8, the results of the chi-square statistic were not significant; therefore, the null hypotheses was not rejected. It can be concluded that the academic major of Malaysian students at Iowa State University is not related to their learning styles as measured by Kolb's learning style inventory.

Hypothesis 5: The learning styles of Malaysian students at ISU are not related to primary sponsorship as measured by Kolb's Learning Style Inventory.

The purpose of this hypothesis was to detect whether there is a relationship between primary sponsorship and learning style. As shown in Table 9, the results of the chi-square statistic were not significant; therefore, the null hypotheses was not rejected. It can be

Table 8. Distribution of students by academic major and learning style

Learning Style	Business		Non-Business		Total	
	N	%	N	%	N	%
Accommodator	12	80.00	3	20.00	15	26.79
Assimilator	11	68.75	5	31.25	16	28.57
Converger	3	30.00	7	70.00	10	17.85
Diverger	11	73.33	4	26.67	15	26.79
TOTAL	37	66.07	19	33.93	56	100.00

$\chi^2 = 7.5065$; df = 3; p = 0.0574

Table 9. Distribution of students by primary sponsorship and learning style

Learning Style	Government		Semi-Government		Total	
	N	%	N	%	N	%
Accommodator	9	60.00	6	40.00	15	26.79
Assimilator	11	68.75	5	31.25	16	28.57
Converger	5	50.00	5	50.00	10	17.85
Diverger	8	53.33	7	46.67	15	26.79
TOTAL	33	58.93	23	41.07	56	100.00

$\chi^2 = 1.1682$; df = 3; p = 0.7606

concluded that the primary sponsorship of Malaysian students at Iowa State University is not related to their learning styles as measured by Kolb's Learning Style Inventory.

Hypothesis 6: The learning styles of Malaysian students at ISU are not related to years of work experience as measured by Kolb's Learning Style Inventory.

The purpose of this hypothesis was to detect whether there is a relationship between years of work experience and learning style. As shown in Table 10, the results of the chi-

Table 10. Distribution of students by years of work experience and learning style

Learning Style	No Experience		Experience		Total	
	N	%	N	%	N	%
Accommodator	9	60.00	6	40.00	15	26.79
Assimilator	10	62.50	6	37.50	16	28.57
Converger	5	50.00	5	50.00	10	17.85
Diverger	10	66.67	5	33.33	15	26.79
TOTAL	34	60.70	22	39.29	56	100.00

$\chi^2 = 0.7287$; df = 3; p = 0.8864

square statistic were not significant; therefore, the null hypotheses was not rejected. It can be concluded that the years of work experience of Malaysian students at Iowa State University is not related to their learning styles as measured by Kolb's Learning Style Inventory.

Hypothesis 7: The learning styles of Malaysian students at ISU are not related to length of stay as measured by Kolb's Learning Style Inventory.

The purpose of this hypothesis was to detect whether there is a relationship between length of stay and learning style. As shown in Table 11, the results of the chi-square statistic were not significant; therefore, the null hypotheses was not rejected. It can be concluded that

Table 11. Distribution of students by length of stay and learning style

Learning Style	Below 12		Above 12		Total	
	N	%	N	%	N	%
Accommodator	5	33.33	10	66.67	15	26.79
Assimilator	8	50.00	8	50.00	16	28.57
Converger	1	10.00	9	90.00	10	17.85
Diverger	7	46.67	8	53.33	15	26.79
TOTAL	21	37.50	35	62.50	56	100.00

$\chi^2 = 4.9422$; df = 3; p = 0.1761

the length of stay of Malaysian students at Iowa State University is not related to their learning styles as measured by Kolb's learning style inventory.

Hypothesis 8: The learning styles of Malaysian students at ISU are not related to years of examination format preference as measured by Kolb's Learning Style Inventory.

The purpose of this hypothesis was to detect whether there is a relationship between examination format preference and learning style. As shown in Table 12, the results of the chi-square statistic were not significant; therefore, the null hypotheses was not rejected. It can be concluded that the examination format preference of Malaysian students at Iowa State University is not related to their learning styles as measured by Kolb's Learning Style Inventory.

Table 12. Distribution of students by examination format preference and learning style

Learning Style	Selection Type		Supply Type		Total	
	N	%	N	%	N	%
Accommodator	8	53.33	7	46.67	15	26.79
Assimilator	7	43.75	9	56.25	16	28.57
Converger	5	50.00	5	50.00	10	17.85
Diverger	9	60.00	6	40.00	15	26.79
TOTAL	29	51.79	27	48.21	56	100.00

$\chi^2 = 0.8463$; df = 3; p = 0.8384

Summary of hypothesis testing

Eight hypotheses were tested to detect whether there are relationships between learning styles and selected demographic characteristics. Chi-square statistics were used to test these relationships. As there was no significant relationship between the learning styles

and the selected demographic characteristics, none of the hypotheses were rejected. It can be concluded that the learning style preferences of Malaysian students at Iowa State University were not related to gender, age, educational level attained, academic major, primary sponsorship, years of work experience, length of stay, and examination format preference.

CHAPTER V. SUMMARY, DISCUSSION, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

The central purpose of this study was to identify and describe the learning styles of Malaysian students at Iowa State University, and to determine the relationships between learning styles and selected demographic characteristics.

The preceding four chapters of this study dealt with the introduction, review of literature, methodology, and results of the study. Chapter 5 summarizes the previous chapters, discusses the results of hypotheses testing, draws conclusions, identifies some educational implications, and makes recommendations for further research.

Summary

Although a better understanding of how people learn has been discussed for years and numerous research studies on learning styles have been documented in journals of education, there have been very few studies of learning styles of Malaysian students. Studies pertaining to the learning styles of Malaysian students are relatively non-existent in the current literature.

The present study was designed to identify and describe the learning styles of undergraduate Malaysian students at Iowa State University, and to determine the relationships between learning styles and selected demographic characteristics of gender, age, educational level attained, academic major, primary sponsorship, years of work experience, length of stay, and examination format preference. The results of this study will be of interest to future researchers studying learning styles and to educators interested in applying learning styles when working with Malaysian population.

Two research instruments were administered in the study: Kolb's Learning Style Inventory (1985) and a Student Demographic Questionnaire. Kolb's Learning Style Inventory was chosen over several others because it has a well-developed theoretical foundation; it was easy to understand and interpret; the styles were well defined; and teaching methods that facilitated changes in instructional methodology had been described for each one.

The Kolb's Learning Style Inventory (1985) is a twelve-item questionnaire. Each items consists of four sentences which respondents are asked to rank order in terms of how they learn best. This process is repeated for each of the twelve four-sentence sets. Upon completion of the inventory, scores are tabulated. These scores reflect an individual's relative emphasis on each of the four modes of learning: concrete experience (CE); reflective observation (RO); abstract conceptualization (AC); and active experimentation (AE). Specific learning style types are calculated by combining the AC-CE and AE-RO scores.

Data were collected from 56 sponsored undergraduate Malaysian students at Iowa State University during spring semester, 1995. Data analyses were conducted using the Macintosh StatView II software package, available through Iowa State University's computer programs and services. Since the samples were small and not random only descriptive statistic and chi-square statistic were used. As Isaac and Michael (1990) explained, the chi-square test is based on a comparison of the data which are observed in practice and those which would have been expected on the basis of probability theory. Two main tests are undertaken using chi-square—one to test whether a data set has a particular distribution (goodness of fit), and the other to test whether two data sets are independent of one another (contingency tests). In

both cases the procedure is similar. The expected value at each level must always be at least five. If it is not, classes must be combined until the adjusted class has an expected value of five or more. In the present study, descriptive statistical analyses were calculated for all variables and the chi-square statistic was used to evaluate relationships between variables.

Discussion

The first objective of the study was to identify and describe the learning style preferences of the subjects based on Kolb's experiential learning model and categories. To meet this objective, means and standard deviations on four learning modes and two learning orientations were calculated (see Table 3). A review of the information in Table 3 indicates that students had lower mean scores on concrete experience (CE). Students' mean scores were higher on abstract conceptualization (AC), active experimentation (AE), and reflective observation (RO). This heavier reliance on the last three stages of the learning cycle may reflect the maturity of the learning process of undergraduates or perhaps the concentration of undergraduate curriculums. As Lassan (1984) reported, as students progress toward the senior year in college, they become less fixed in one learning style and show a tendency to become better able to learn through a variety of modes. As students develop the capacity to learn in a variety of learning modes, they attain the skills to cope with and adapt to the educational environment. This may reflect the many screenings students have successfully completed either in Malaysia or in the United States.

Additional factors might be that the subjects in the study sample were close to completion of their undergraduate programs and their learning preferences may have

developed over time. Kolb (1976) does present some theoretical support that learning preferences may change over a person's lifetime, from more concrete to more abstract. Furthermore, Kolb reports an increasing tendency toward the active experimentation dimension as a student progresses to a higher level of education. Kolb (1981) asserts that all four stages in the learning cycle are needed in order for the most effective learning to occur. It may be concluded that a student's degree of success/failure, would be influenced by the student's competencies in the learning process. As Kolb (1976) points out, no particular learning modes in the four-stage learning cycle are better or worse than any other. The key to effective learning is being competent in each learning mode when it is appropriate.

Using Kolb's Learning Style Inventory (1985), it is possible to identify four learning styles: divergers, assimilators, convergers, and accommodators. A major advantage of this model is that it takes into account the fact that learning is a continuing process of interaction with the experience in one's life—past and present, as well as the demand of the present environment. All four learning styles were represented in the sample. As a group, the sample included a greater number of assimilators (28.57%). The sample also included a higher proportion of accommodators (26.79%). A similarly strong preference was shown for divergers (26.79%). The preferences exhibited for convergers were not very strong (17.85%). However, findings from the chi-square analysis revealed that there were no significant differences in the preferences of students on the learning styles; chi-square ($3, N = 56) = 1.57, p = .67$. Thus, the distribution was relatively uniform and lacked any predominant learning styles among the students. The Malaysian students at Iowa State

University were more homogeneous, and more evenly distributed across learning styles. This finding contradicts the findings of Kolb (1984) who reported that most undergraduate students are divergers. This may be due to small sample sizes or to personal factors, the details of which were not obtained by the study. The lack of any predominant learning styles among students may provide support that learning style and career choice are not related.

The assimilator's dominant learning preferences are abstract conceptualization (thinking) and reflective observation (watching). The assimilator is oriented toward theory through inductive reasoning, and Kolb has identified this group with the lecture format. This learning style is characteristic of persons in mathematics, physical science, law, and education. The accommodator prefers learning through concrete experience (feeling) and active experimentation (doing). The accommodator tends to prefer active involvement in learning, which would seem compatible with hands-on skills workshops. Accommodators tend to have a technical or practical education, such as in management, banking, marketing, and business. The diverger prefers to learn through concrete experience (feeling) and reflective observation (watching). The diverger is typically imaginative in approaching learning through a generation of ideas. This learning style is characteristic of persons in nursing, psychology, journalism, and theater. While the converger's dominant learning abilities are abstract conceptualization (thinking) and active experimentation (doing), the converger is more involved in practical application of ideas, employing deductive reasoning. This learning style is characteristic of persons in engineering, computer science, medicine, and economics. The small group problem-based approach would seem to be suited to both of these types (Kolb, 1985).

The second objective of the study was to determine the relationships between dependent variables (learning styles) and independent variables (selected demographic characteristics). The selected demographic characteristics of gender, age, educational level attained, academic major, primary sponsorship, years of work experience, length of stay, and examination formats preference, may affect learning styles. A supportive learning environment may be critical for these students. A student's learning style at any given moment is shaped by the student's personality disposition toward introversion and feeling, undergraduate specialization, and academic commitment; and the demand of student's current study, and the specific task on which the student is working.

To balance the research design and aid in data analysis, the independent variables of age, academic major, years of work experience, length of stay, and examination format preference were recoded. In order to determine if the independent variables differed significantly in terms of the learning styles, a series of chi-square analysis were conducted associating these variables with the learning styles.

The relationship between learning styles and gender was assessed using the chi-square statistic. No significant relationship was found. This is similar to results obtained by Kirk (1986), and Loesch and Foley (1988) who found that gender is not related to learning style preference. However, this finding differs from findings by Kolb (1976), and Dorsey and Pierson (1984) who reported that learning styles differ by gender.

The next part of the research involved the study of age and learning style. Age was modified from three to two categories of below 23 years and above 23 years. The relationship

between learning styles and two age groups was assessed using the chi-square statistic. Again, no significant relationship was found. This is similar to results obtained by Kirk (1986), and Loesch and Foley (1988) who also found that age is not related to learning style preferences. This lack of a significant relationship is contrary to the findings by Kolb (1976), and Dorsey and Pierson (1984) who concluded that learning styles differ by age group. Dorsey and Pierson (1984) found that learning style is curvilinearly related to age.

Students were categorized by certificate or diploma recipients as their educational level attained. The result of the chi-square analysis showed that there was no significant relationship between educational level attained and their learning style preferences. It was not possible to relate this finding to previous research because this is the first study to determine this factor in comparison to learning style preferences.

Academic major was modified from three to two categories of business and non-business. The relationships between these two variables and learning styles were assessed using the chi-square statistic. This study revealed no statistically significant relationship between learning styles and academic major. This lack of significant relationships is contrary to the findings by Kolb (1984) whereby learning styles were related to undergraduate major.

All the hypotheses were tested at .05 level of significance. The level of significance is used to make decision about rejecting the null hypotheses. It is not uncommon for researchers to establish the level of significance after the statistical analyses have been completed. In this case, the results should support Kolb's finding if the researcher were to change the level of significance to .10.

The students who participated in this research were paying for their education basically through federal government scholarships and semi-government scholarships. The result of the chi-square analysis showed that there was no relationship between learning styles and primary sponsorship. It was not possible to relate this finding to previous research because this is the first study to investigate primary sponsorship in comparison with learning style preferences.

Furthermore, years of work experience was modified from four to two categories of no experience and experience. The relationships between the two variables and learning styles were assessed using the chi-square statistic. Again, no significant relationships were found. As a result, this finding was unable to support the relationship between learning styles and years of work experience, as Dorsey and Pierson (1984) had previously established.

Likewise, length of stay was modified from three to two categories of below 12 months and above 12 months. The chi-square analysis of the relationship between learning styles and length of stay produced similar results. No significant relationship was found. This lack of significant relationship is contrary to the findings by Reid (1987) whereby length of time spent in the United States related to learning style preferences.

The last part of the research involved the study of the association between examination format preference and learning styles. Examination format preference was modified from five types to two types of selections: (matching, multiple choice, and true-false) and supply type (essay and short answer). The results of the chi-square analysis showed that there was no relationship between examination format preference and learning styles. It was not possible to relate this finding to previous research because this is the first study to determine this factor in

comparison of learning style preferences.

All eight of the postulated hypotheses failed to be rejected. The overwhelming absence of association leads to the conclusion that learning style preferences of Malaysian students at Iowa State University as measured by Kolb's Learning Style Inventory (1985) do not affect the selected demographic characteristics of gender, age, educational level attained, academic major, primary sponsorship, years of work experience, length of stay, and examination format preference.

It must be emphasized that the findings are based on the use of the Kolb's Learning Style Inventory (1985) as the measuring yardstick. Psychometric problems with this instrument limit the meaningful interpretation of any results obtained. The major criticisms of Kolb's Learning Style Inventory according to some researchers were: (a) Kolb's Learning Style Inventory artificially supports the bipolar learning dimensions of Kolb's construct due to its forced-ranking format; (b) ranking, an ipsative approach which bases scores on the individual's norm, produces scores which are not comparable among subjects; (c) there are no clear indications as to where to place the axes in the four cell plots; (d) the format of the four choices offered for each item may produce a falsely high internal consistency measurement; (e) Kolb's Learning Style Inventory lacks construct validity; and (f) a low test-retest reliability was apparent. Thus, use of this instrument for research purposes is unlikely to yield meaningful results.

These findings are consistent with those of Wunderlich and Gjerde (1978), who found that Kolb's Learning Style Inventory (1976) was not useful for predicting career specialty

choice of medical students. A lack of significant relationships between learning style and other variables was also revealed in research conducted with nursing students (DeCoux, 1990). This indicates that Kolb Learning Style Inventory (1985) is not useful for predicting purposes. As Brown and Burke (1987) explained, the nature of the Kolb's Learning Style Inventory (1985) (a 4-point scale and forced-choice ranking format), coupled with the interdependencies among the four modes in the underlying learning model, generate data which are more suitable for developing descriptive statistics than for constructing and testing hypotheses of significant differences. This study basically generated descriptive statistics about the sample population.

The findings from this study must be considered as preliminary because the study had several weakness. The sample in the study was essentially a convenience sample. The absence of random selection of students prevents the findings from being projected to a larger statistical population. This study is limited in generalizability due to its small sample size and the small geographical area from which the sample was drawn. Many of the students were from the College of Business. The learning style instrument is a self report inventory, and accuracy is dependent upon the subject knowing themselves and wanting to reveal that knowledge (Bonham, 1988).

The value of the results obtained in this study depends greatly upon the validity and reliability of the learning style instrument. Kolb's Learning Style Inventory (1985) is not sensitive enough by itself to be useful for investigating the relationship between learning styles and selected demographic characteristics. The instrument has many psychometric limitations

to provide a solid foundation for research on learning styles. Thus, the Kolb Learning Style Inventory (1985) is not recommended for research purposes. This instrument may be useful for counseling individual students in conjunction with other instruments to assess personality and value structures to aid the students in career planning. Since counseling involves learning and exploration, Kolb's model is ideally suited to be used to more fully comprehend the counseling process. Students can use Kolb's ideas to select compatible learning activities and to expand and improve their learning skills.

Conclusions

The researcher made the following conclusions based on the results of the data presented in Chapter 4:

1. There was no dominant learning style preference among Malaysian students at Iowa State University as measured by Kolb's Learning Style Inventory (1985). All the four type of learners—divergers, assimilators, convergers, and accommodators—were present and evenly distributed.
2. The learning style preferences of Malaysian students at Iowa State University as measured by Kolb's Learning Style Inventory (1985) do not relate to selected demographic characteristics of gender, age, educational level attained, academic major, primary sponsorship, years of work experience, length of stay, and examination format preference.

Implications

The present research contributes to the literature on learning styles of Malaysian students. Trends in the data should help college administrators and faculty see opportunities to focus on the needs of students so that students can achieve proficiently. The findings suggest that Malaysian students at Iowa State University may utilize and be successful with varied approaches to learning. To make learning accessible to the array of styles represented, to evaluate fairly, and to help students develop the nondominant aspects of their styles, program faculty are encouraged to draw actively upon all components of the learning process in their design of teaching approaches and evaluation measures.

Information on learning styles can be used in a variety of ways including, for example, aiding decisions about programs or creating a dialogue on decisions about programs, and creating a dialogue with, or counseling individual learners about their strengths, weaknesses and opportunities. Instructional delivery (methods and materials) can be made more congruent with learning style preferences.

This study also adds to the body of knowledge relating to foreign students studying in the United States. In order to provide an effective learning environment, a variety of instructional methods (e.g., discussion, supervised study, lecture, case studies, demonstrations, role play, supervised study, field trips, resource people, experiments), curriculum materials (e.g., textbooks, handouts, worksheets), and assessment techniques (e.g., essays, short answer, multiple choice, matching, true-false) based on students' learning styles are recommended.

Additional information provided about the influence of demographic variables can enhance university policies on foreign students studying in the United States who have been found to be significantly different from American students. This may have important implications for academic advisement, individual instruction, students assessment, and independent studies.

Educators need to be aware of differences among individuals and the effect these differences have on ways in which students seek meaning from their surroundings. Individual differences must be realized and various educational methodologies be available to students to meet instructional objectives. Students should be allowed to select alternative instructional techniques enabling them to capitalize on their unique skills and abilities. In order to develop such educational alternatives, a full understanding of learning style and how it interacts with individual methodologies is paramount.

Identifying a student's learning styles would be useless if it did not lead to changes in the curriculum, methods of instruction and learning environment to meet the student's needs. Educators must be willing to alter the way they teach, the instructional materials they use and the environment in which students learn to complement each individual's strengths. Programs that are geared to pupils' learning styles must be individualized to accommodate individual differences. Individualization must be maintained in order for all four learning styles to be adequately addressed.

Some researchers recommended that faculty members should incorporate the four models of the experiential learning cycle/mode into student learning activities. Learning is a

cyclic process involving four kinds of styles (i.e., feeling, watching, thinking, and doing). All normal adults possess and use all of the four styles. Specifically, the researchers have proposed giving students the opportunity to learn through concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE). According to research on learning styles: 20 percent is retained if only AC is used; if both RO and AC are used, retention is increased to 50 percent; if one uses CE+RO+AC, it rises to 70 percent; and 90 percent is retained if all four learning stages (CE+RO+AC+AE) are employed.

Students should have knowledge of their own preferred learning style. During freshmen orientation programs, students should be assessed for their preferred learning style and offered counseling on how to adapt their learning style to various teaching styles.

Recommendations for Further Research

Based on the findings and conclusions of this study, the following recommendations for further research are presented.

This study was exploratory in nature and suggests several areas for future research as well as well as procedures for use in future research. Future research which examines learning styles may benefit by gathering information about learning styles prior to the random assignment of subjects to insure equal numbers of subjects in each of the four learning style quadrants to correspond with each of the selected characteristics.

Since this was a baseline study, further studies need to be undertaken to see if these findings are consistent. Studies similar to this one should be conducted using a larger

population to compare the learning styles of sponsored and non-sponsored Malaysian students at Iowa State University. A follow-up study of those who graduate and those who fail to graduate should be conducted.

A longitudinal study that keeps track of the learning style changes of Malaysian students, from their student years to their later years in their careers, would be beneficial. Such a study would examine the factors that influence students' learning styles.

Research on the learning styles of Malaysian students need to be conducted using larger, randomly selected samples at undergraduate and graduate levels, and should cover additional variables such as academic performance and achievement, instructional method preferences, computer preferences, curriculum, and number of activities.

The learning styles of Malaysian students can be studied using various learning style instruments. A study should be undertaken to determine the relationship between learning styles and teaching styles used in selected classes.

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APPENDIX A. HUMAN SUBJECTS APPROVAL FORM

Last Name of Principal Investigator Muslim

ecklist for Attachments and Time Schedule

The following are attached (please check):

12. [X] Letter or written statement to subjects indicating clearly:
    a) purpose of the research
    b) the use of any identifier codes (names, #'s), how they will be used, and when they will be removed (see Item 17)
    c) an estimate of time needed for participation in the research and the place
    d) if applicable, location of the research activity
    e) how you will ensure confidentiality
    f) in a longitudinal study, note when and how you will contact subjects later
    g) participation is voluntary; nonparticipation will not affect evaluations of the subject

13. [ ] Consent form (if applicable)

14. [ ] Letter of approval for research from cooperating organizations or institutions (if applicable)

15. [X] Data-gathering instruments

16. Anticipated dates for contact with subjects:

First Contact	Last Contact
4/9/95	4/16/95
Month / Day / Year	Month / Day / Year

17. If applicable: anticipated date that identifiers will be removed from completed survey instruments and/or audio or visual tapes will be erased:

Month / Day / Year

18. Signature of Departmental Executive Officer | Date | Department or Administrative Unit

3/3/95 I E & T

19. Decision of the University Human Subjects Review Committee:

X Project Approved ___ Project Not Approved ___ No Action Required

Patricia M. Keith | 4/10/95 | Signatu
Name of Committee Chairperson | Date

The principal investigator is requested to put the consent form on letterhead paper and/or list address & phone number where he can be reached.

GC:1/90 Hashim Bin Muslim, P.I., is willing to include his address & phone number on the consent form.

— Per Hashim Bin Muslim 4/7/95

APPENDIX B. SURVEY INSTRUMENT

Learning-Style Inventory: Instructions

The Learning-Style Inventory describes the way you learn and how you deal with ideas and day-to-day situations in your life. Below are 12 sentences with a choice of four endings. Rank the endings for each sentence according to how well you think each one fits with how *you* would go about learning something. Try to recall some recent situations where you had to learn something new, perhaps in your job. Then, using the spaces provided, rank a "4" for the sentence ending that describes how you learn *best*, down to a "1" for the sentence ending that seems *least* like the way you would learn. Be sure to rank all the endings for each sentence unit. Please do not make ties.

Example of completed sentence set:

When I learn:	4	I like to deal with my feelings	1	I like to watch and listen	2	I like to think about ideas	3	I like to be doing things

1.	When I learn:	____	I like to deal with my feelings	____	I like to watch and listen	____	I like to think about ideas	____	I like to be doing things
2.	I learn best when:	____	I trust my hunches and feelings	____	I listen and watch carefully	____	I rely on logical thinking	____	I work hard to get things done
3.	When I am learning:	____	I have strong feelings and reactions	____	I am quiet and reserved	____	I tend to reason things out	____	I am responsible about things
4.	I learn by:	____	feeling	____	watching	____	thinking	____	doing
5.	When I learn:	____	I am open to new experiences	____	I look at all sides of issues	____	I like to analyze things, break them down into their parts	____	I like to try things out
6.	When I am learning:	____	I am an intuitive person	____	I am an observing person	____	I am a logical person	____	I am an active person
7.	I learn best from:	____	personal relationships	____	observation	____	rational theories	____	a chance to try out and practice
8.	When I learn:	____	I feel personally involved in things	____	I take my time before acting	____	I like ideas and theories	____	I like to see results from my work
9.	I learn best when:	____	I rely on my feelings	____	I rely on my observations	____	I rely on my ideas	____	I can try things out for myself
10.	When I am learning:	____	I am an accepting person	____	I am a reserved person	____	I am a rational person	____	I am a responsible person
11.	When I learn:	____	I get involved	____	I like to observe	____	I evaluate things	____	I like to be active
12.	I learn best when:	____	I am receptive and open-minded	____	I am careful	____	I analyze ideas	____	I am practical

Part II

Instructions: Please fill in the blank with the information requested OR place an X in the blank preceding the answer that best applies to you.

1. What is your sex? .....Male .....Female

2. What is your age? .....Years

3. Name the last institution you attended after graduating from secondary school?

.....

4. What is the highest education level attained after graduating from secondary school?

.....Diploma

.....Certificate

.....None

5. When did you first register as a student at ISU?

.....Year .....Semester

6. What is your current academic major?

.....

7. Who is sponsoring your education at ISU?

.....Federal Government

.....Semi-Government agencies

8. How many years of working experience do you have prior to enrolling at ISU?

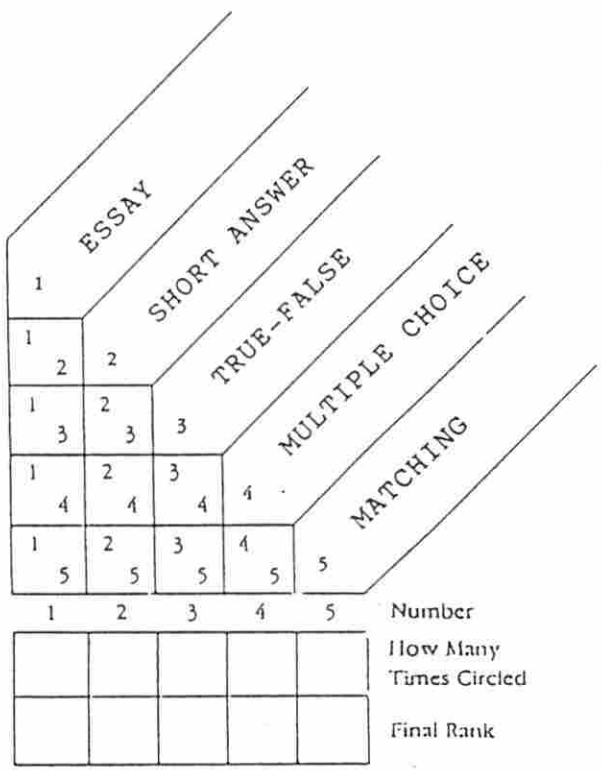
.....Years

9. When is your expected date of graduation?

.....Year .....Semester

(OVER, PLEASE)

10. In the blanks below are five common examination formats. Each examination format is designated by a number. For each number pair in the matrix, ask yourself: Which examination format do I prefer? Circle the number of that choice. When you have finished circling, record the total number of times you have chosen each examination format and rank them accordingly from (1) most preferred to (5) least preferred.



- THANK YOU FOR PARTICIPATING IN THIS STUDY -

APPENDIX C. CONSENT FORM

INFORMED CONSENT STATEMENT

The purpose of this statement is to give you information to help you decide if you wish to participate in a masters thesis research project investigating whether gender, age, educational level attained, academic major, primary sponsorship and examination formats preferences exist in the preferred learning styles among undergraduate Malaysian students at Iowa State University. If you decide to participate, you will be asked to respond to a survey which takes about 20-30 minutes to complete.

A summary of the results of this research will be made available to you so that you may benefit from this study by learning what your preferred learning style is and in what ways you can improve your learning efficiency. This information may help you with your universities studies. Your involvement in this study may help people learn better and more efficiently than is presently the case.

There are no known risks and all your answers will be treated with strict regard for your confidentiality. Your name will not be associated with any of the research data. Only summaries of group data will be reported.

Participation in this research is completely voluntary and you may withdraw at any time without consequences.

Do you have any questions? If so, please ask them now.

Thank you for your time and assistance.

Hashim Bin Muslim,
Graduate Student,
Industrial Education & Technology.

I HAVE READ AND UNDERSTAND THE ABOVE INFORMATION AND AGREE TO PARTICIPATE IN THIS STUDY.

Signature.....

Print Your Full Name.....

Date.....